

# Notice of Allowability

Application No.

10/027,990

Examiner

Lina Yang

Applicant(s)

JUNG, DAE-KWON

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 6/19/2001.
2. ☒ The allowed claim(s) is/are 1-13.
3. ☒ The drawings filed on 12 February 2002 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

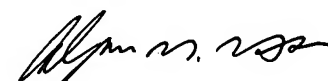
\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                            |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>30</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                                    |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance                   |
|   | 9. <input type="checkbox"/> Other _____  |

  
ALPUS H. HSU  
PRIMARY EXAMINER

***Examiner's Amendment***

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Paul Farrell on \*\*6/29/2005\*.

The application has been amended as follows.

In the claims:

Claim 6 (line1) "claim 4" has been changed to "claim **5**" for proper claim dependency;

Claim 7 (line1) "claim 4" has been changed to "claim **5**" for proper claim dependency;

Claim 8 (page 18 line 6) "a correlator for separating a received signal into M sub-blocks" has been changed to "a correlator for separating a received signal **of length N** into M sub-blocks" for clarifying the received signal.

***Allowable Subject Matter***

1. Claims 1-13 are allowed.

The following is an examiner's statement of reasons for allowance:

Claims 1-4 are allowable since prior art of record, in addition to other limitations recited in claims 1-4, do not teach or suggest an OFDM (Orthogonal Frequency Division Multiplexing) transmitting apparatus where serial input data is converted to parallel data blocks of length  $N$ , comprising: a rotational sub-block partitioner for partitioning the input data block of length  $N$  into  $M$ , the number of sub-block, and distributing the partitioned data of length  $L$  ( $N/M$ ) into  $M$  sub-blocks one by one rotationally;  $M$  IFFTs (Inverse Fast Fourier Transformers) for performing  $L$ -point IFFT on the successive  $N/M$  data assigned to each  $M$  sub-block;  $M$  coefficient multipliers for multiplying the  $N/M$  data output from each IFFT by predetermined coefficients to give orthogonality to the frequency components of the  $N/M$  data; a phase factor optimizer for optimizing  $M$  phase factors to minimize a PAPR (Peak-to-Average Power Ratio) using the  $N/M$  output values of each coefficient multiplier;  $M$  multipliers for multiplying the optimized  $M$  phase factors by the corresponding outputs of the coefficient multipliers; and an adder for summing the outputs of the  $M$  multipliers on a symbol-to-symbol basis.

Claims 5-7 are allowable since prior art of record, in addition to other limitations recited in claims 5-7, dose not teach or suggest an OFDM receiving apparatus for receiving a signal from an OFDM transmitting apparatus, comprising: a correlator for separating a received signal into M sub-blocks using the orthogonality of frequencies in the signal; a phase factor eliminator for multiplying the separated data of length L from each sub-block by a predetermined inverse phase factor; M inverse coefficient multipliers for multiplying each of the output data with length L received from the phase factor eliminator by predetermined coefficients to eliminate orthogonal components from frequency components of the output data; M FFTs (Fast Fourier Transformers) for performing L-point FFT on the output data with length L received from each inverse coefficient multiplier; and a deinterleaver for deinterleaving the output data received from the FFTs to recover an original data of the received output data.

Claim 8 is allowable since prior art of record, dose not teach or suggest an OFDM receiving apparatus for receiving a signal of which the peak power is decreased by performing L-point IFFT by  $X_n^{(m)}$  and using a predetermined coefficient multiplier, the apparatus comprising: a correlator for separating a received signal of length N into M sub-blocks using the orthogonality of frequencies in the signal; a phase factor eliminator for multiplying the separated data with Length L from each sub-block by a predetermined inverse phase factor; M inverse coefficient multipliers for multiplying each of the output data with length L of each sub-block received from the phase factor eliminator by predetermined coefficients to eliminate orthogonal components from the

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frequency components of the signal;  $M$  FFTs for performing  $L$ -point FFT on the output data with length  $L$  received from each inverse coefficient multiplier; and a deinterleaver for deinterleaving signals received from the FFTs to recover an original signal of the received signal.

Claim 9 is allowable since prior art of record, does not teach or suggest a method of transmitting an OFDM signal from an OFDM transmitting apparatus, comprising the steps of: dividing serial data to be transmitted into data blocks of length  $N$ ; distributing the data of the divided data block of length  $N$  to  $M$  sub-blocks one by one rotationally; performing  $L(N/M)$ -point IFFT on distributed  $N/M$  data assigned to each  $M$  sub-block; multiplying the  $N/M$  data output from each IFFT by predetermined coefficients to give orthogonality to the frequency components of the  $N/M$  output data; generating optimal  $M$  phase factors to minimize a PAPR using the coefficient multiplication results; multiplying the  $M$  optimized phase factors by the multiplication results; and summing the products of the phase factors and the coefficient multiplication results on a symbol-to-symbol basis.

Claim 10 is allowable since prior art of record, does not teach or suggest a method of receiving a signal from an OFDM receiving apparatus, comprising the steps of: separating a received signal of length  $N$  into  $M$  sub-blocks using the orthogonality of frequencies in the signal; multiplying the separated data of length  $L$  from each sub-block by a predetermined inverse phase factor; multiplying each output data of length  $L$

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from the M sub-blocks by predetermined coefficients to eliminate orthogonal components from frequency components of the output data; performing  $L(N/M)$ -point FFT on the multiplied data of length L; and deinterleaving the L-point FFT output data to recover an original data.

Claim 11 is allowable since prior art of record, does not teach or suggest an OFDM transmitting apparatus, comprising: a rotational sub-block partitioner for distributing parallel data blocks of length N to M sub-blocks one by one rotationally so that  $N/M$  data of length L is assigned to each sub-block; M IFFTs for performing  $L(N/M)$ -point IFFT on the  $N/M$  data assigned to each of the M sub-blocks; M coefficient multipliers for multiplying the  $N/M$  data output from each IFFT by predetermined coefficients to give orthogonality to the frequency components of the  $N/M$  output data; a phase factor optimizer for generating M phase factors to minimize a PAPR using the output of each coefficient multiplier; M multipliers for multiplying the optimized M phase factors by the outputs of the coefficient multipliers; and an adder for summing the outputs of the M multipliers on a symbol-to-symbol basis.

Claim 12 is allowable since prior art of record, does not teach or suggest an apparatus of recovering original data in OFDM (Orthogonal Frequency Division Multiplexing) system, comprising: a rotational sub-block partitioner for partitioning the input data block of length N into M, the number of sub-block, and distributing the partitioned data of length L ( $N/M$ ) into M sub-blocks one by one rotationally; M IFFTs

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(Inverse Fast Fourier Transformers) for performing L-point IFFT on the successive N/M data assigned to each M sub-block; M coefficient multipliers for multiplying the N/M data output from each IFFT by predetermined coefficients; M inverse coefficient multipliers for multiplying each output data of length L received from the phase factor eliminator by the inverse number of the predetermined coefficients transmitted from the M coefficient multipliers; and M FFTs (Fast Fourier Transformers) for performing L-point FFT on the output data of length L received from the corresponding inverse coefficient multipliers.

Claim 13 is allowable since prior art of record, does not teach or suggest a method of recovering original data in OFDM (Orthogonal Frequency Division Multiplexing) system, comprising the steps of: distributing the input data of the data block of length N to M sub-blocks one by one rotationally; performing L(N/M)-point IFFT on successive N/M data assigned to the corresponding M sub-blocks; multiplying the N/M data output from each IFFT by predetermined coefficients; multiplying each output data of length L from the M sub-blocks by inverse number of the coefficients generated; and performing L(N/M)-point FFT on the multiplied data of length L.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Cimini, Jr. et al. (U. S. Patent No. 6,556,557 B1) discloses a method and system for reducing of peak-to-average power ratio of transmission signals comprising overlapping waveforms. In particular, an iterative technique utilizing the PTS approach is used to assign phase factors to each of a set of partial transmit sequences from a set of possible phase factors.

Muller et al. (***Electronics Letters***, Vol. 33, issue 5, 2/27/1997 pages: 368-369) discloses a very effective and flexible peak power reduction scheme for OFDM with almost vanishing redundancy. More specifically, this method works with arbitrary numbers of subcarriers and unconstrained signal sets by combining PTS to minimize the peak-to-average power ratio distortionless.

Tellado et al. (U. S. Patent No. 6,314,146 B1) discloses a method and system for reducing the peak to average power ratio of a multi-carrier signal by clipping an original signal at transmission.



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Tellado et al. (U. S. Patent No. 6,314,146 B1) discloses a method and system for reducing the peak to average power ratio of a multi-carrier signal by selecting a subset of a plurality of frequencies that make up a multi-carrier symbol.

Tellado et al. (U. S. Patent No. 6,314,146 B1) discloses a method and system for reducing the peak to average power ratio of a multi-carrier signal by applying a peak reduction signal component to one or more of the plurality of information signals that make up the multi-carrier signal.

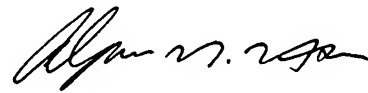
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3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lina Yang whose telephone number is (571)272-3151. The examiner can normally be reached on 7:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571)272-3155. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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